



# USC University of Southern California

## GEOL 108Lg: Crises of a Planet

### Description

**Units:** 4

**Term-Day-Time:** Fall-Tu/Th-11-12:30

**Location:** SAL 101

**Instructor:** Sylvain Barbot ([sbarbot@usc.edu](mailto:sbarbot@usc.edu))

**Office:** ZHS 105

**Office Hours:** Friday 11-12.

**Mid-term I:** Tuesday, October 1st at SAL 101.

**Mid-term II:** Thursday, October 31 at SAL 101.

**Final Exam:** Tuesday, December 17, 8-10 am.

### Teaching Assistants

Shiyong Nie ([shiyongn@usc.edu](mailto:shiyongn@usc.edu)), office: ZHS 154

Sharadha Sathiakumar ([sathiaku@usc.edu](mailto:sathiaku@usc.edu)), office: ZHS 154

Luis Vasquez Aragon ([luisalbe@usc.edu](mailto:luisalbe@usc.edu)), office: ZHS 266

Ryley Collins ([rmcollin@usc.edu](mailto:rmcollin@usc.edu)), office ZHS 305.

**TA Office Hours:** To be determined

### Course Description

Earth is a dynamic system that has emerged from billions of years of evolution. Unique in the solar system, the young face of our planet is preserved by the many feedbacks among important processes that have shaped the air we breathe and the landscapes we roam. Historically, these processes have operated at time scales that are challenging to grasp, but we should not take the world for granted. Because of the large human population and its environmental footprint, the world's ecosystems are changing faster than ever before. Species are disappearing at alarming rates on land and offshore. Global temperatures are warming, sea levels are rising, and climate is changing. To better appreciate the fragility of our environment, we will discuss our origins. How did our planet form? How did life appear? How did species and their environment co-evolve? What was the climate like throughout Earth's history and how do we know? We will plunge into deep time to better understand our present and positively influence our future. Because of our collective actions, past and present, the Earth is in crisis. In this class, we will examine the Earth as a physical system and describe the pathways of change, the causes and effects, and the current challenges of humanity in the face of a rapidly changing planet.

### Learning Objectives

By the end of this course, the students will be able to recall the major events that took place throughout Earth's history. The students will be able to describe the major layers of the Earth and its atmosphere and to identify the major types of rocks. The students will be able to recognize important tectonic regions on Earth and their significance. The students will be able to understand the different factors that affect the climate and how the climate has evolved in all of Earth's history. The students will familiarize themselves with natural hazards, including earthquakes, volcanos, and sea-level rise. The students will familiarize themselves with different types of maps.

Overall, the students will learn about the impacts of human activity on the natural world and the consequences on climate, ecosystems, and future sustainability.

**Prerequisite(s):**

This is a General Education class and there are no prerequisites.

**Communication**

Regular communication will be conducted through Blackboard (<https://blackboard.usc.edu>). In-class participation will be conducted using Blackboard. Ask for appointment with class instructor or teaching assistant via email. All lectures will be posted on Blackboard shortly before the class. You are not required to read the lecture before class. Feel free to follow the material on your laptop during class. The lecture notes include bold words. Make sure that you can define them and use them in context. This will be tested during mid-terms and the final. We will not provide more study material. It is your responsibility to organize your notes and prepare for your exams.

**Required Materials**

Access to a smartphone or a laptop is required for in-class work and assessment of attendance.

**Description and Assessment of Assignments****Description and Assessment of Assignments**

There will be no home assignments, but students are required to read the relevant notes before the laboratory. In-class participation during lectures will involve quizzes using an online system that requires either a laptop or a smartphone. These quizzes and attendance together count for 5% of the grade. The laboratories will systematically start with a quiz on paper. The lab quizzes and lab attendance counts for 25% of the final grade. There will be possibilities for extra credit, which includes active participation in the field trip, sanctioned by a report that can be filled in the same day, during bus transit. The field trip is optional and counts for 5% of the final grade as extra credit. The Joint Educational Project (JEP) partners with your instructor to coordinate learning opportunities for nearby schools, positively impacting our community in Los Angeles. Participation in the JEP program counts for extra credit up to 15%, subject to independent evaluation and grading by JEP staff. Fall sign-ups for JEP begin Monday, August 26. You are encouraged to sign-up in the first two weeks of the Fall 2019 semester. The last day to sign up for JEP is September 6, 2019 and the deadline to drop JEP is October 11, 2019.

**Participation**

Lecture attendance is assessed through an online application that requires a smartphone or a laptop. The combination of attendance and quiz counts for 5% of the final grade. Attendance at the lab and lab quiz count towards 25% of the grade.

**Field trip**

There will be a field trip on either or both of October 26 and October 27, 2019 to visit geological and engineering sites around Los Angeles. Each trip will be a day trip with bus transportation. You will need to bring hiking shoes, comfortable pants or shorts, and your own lunch and water. The field trip is for extra credit. There will be no make-up opportunity if you cannot attend, whatever the reason. The trips will be organized on two different days during a weekend to accommodate your potential timing conflicts. You are invited to participate in both of the field trips. Only one field trip is required for extra credit. Attending both field trips does not give you additional credit than attending only one of them.

The first field trip on Saturday, October 26, 2019 will be to the San Andreas Fault around Palmdale, CA. We will meet at 7:15 am in front of the Zumberge building (Earth Sciences) and embark on the bus at 7:30 am. We will visit an aqueduct that crosses the fault. We will discuss how the aqueduct contributes to the water budget in Los Angeles. We will visit several outcrops of the San Andreas Fault, which is currently overdue for a large earthquake. This involves walking short distances in rugged terrain, as you walk from the Pacific Ocean plate and the North American plate. You will get dirty from this. We will be back at USC at 6 pm.

The second field trip on Sunday, October 27, 2019 will be farther away in the Mojave desert. We will meet at 7:15 am in front of the Zumberge building (Earth Sciences) and embark the bus at 7:30 am. Along the way, we will pass wind farms, solar farms, and various mines that are essential for California's sustainable energy supply and economy. We will visit the site of the recent Mw=7.1 Ridgecrest earthquakes that shook Southern California this summer. We will walk along some of the mile-long cracks that emanated large seismic waves. (Stay away from the cracks, they are currently moving slowly and being monitored by geologists.) Then, we will visit the Trona Pinnacles, rock formations that emerged at the bottom of an ancient lake. This will involve a longer, more leisurely hike than the first field trip. Bring your cameras, as the site is of spectacular beauty. We will be back at USC at 8 pm.

In order for us to book and schedule buses, we ask you to register for the field trip on Blackboard before September 15<sup>th</sup>. Because the October 27<sup>th</sup> field trip involves dirt roads, requiring small buses, fewer spots will be available. Remember, the field trip is optional, but your enthusiasm is not.

### Grading Breakdown

There will be 2 mid-term exams, representing 20% and 25% of the final grade, respectively. We will have a final exam, which will count for 25% of the final grade. Lecture attendance and quiz count towards 5%. Attendance at the laboratory and quiz will count the remaining 25%. You must pass the lab component to pass the course. For P/NP option, P requires a C or better. Extra credit with attendance and participation through the online system up to 5%. Active participation in the field trip up to 5%. Extra credit with JEP 15%. There will be no other form of extra credit.

Assignment	% of Grade	Extra Credit (%)
Lecture attendance and quiz	5	
Mid-term I	20	
Mid-term II	25	
Laboratory quiz and attendance	25	
Final	25	
Total	100	
Field trip		5
JEP		15

### Academic Accommodations

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me as early in the semester as possible. DSP can be reached at [ability@usc.edu](mailto:ability@usc.edu) and is open 8:30am-5:00pm Monday through Friday. The phone number for DSP is 213-740-0776.

### Academic integrity

University policies on academic dishonesty are printed in SCAMPUS. Because cheating negatively affects everyone in the class, we will follow USC guidelines and report all academic misconduct. USC policies on cheating are strict and the minimum punishment is failure in the class and possible expulsion (<https://policy.usc.edu/student/scampus/>). Please don't make us have to turn you in! And remember that even the appearance of impropriety can be a concern.

### Attendance

We will accommodate student athletes who cannot attend a lecture, quiz, or mid-term exam with approved Travel Request Letters. We will also accommodate students who give advance notice of religious observation. In each case, we will work with you to find another date to schedule the exam, preferably in the first few days following the original date.

## Classroom norms

Student participation during lecture and laboratories and encouraged. Always feel free to ask questions and clarifications. The comments that you make (asking for clarification, sharing critiques, expanding on a point) should reflect that you have paid attention to the instructor comments. Active participation in the laboratories is also strongly encouraged. Do not hesitate to solicitate your teaching assistant should you have any questions with the material.

## Course evaluation

Course evaluation will be conducted with two mid-term exams at the time of lectures. A short quiz will take place at the begining of each lab.

## Lecture outline

	<u>approx. # of lectures</u>
I. The Earth	6
a. Space and the solar system	
b. Internal structure and composition	
c. The rock cycle	
d. Plate tectonics	
e. California geology	
f. Biogeochemical Cycles	
II. Geologic Hazards	7
a. Geomorphology - faults, erosion, deposition	
b. Earthquakes and tsunamis - causes, effects, prediction	
c. Volcanic eruptions - past, future	
d. Mass movement - landslides, subsidence	
f. Floods - hydrologic cycle, runoff, erosion	
III. Natural Resources	7
a. Surface Water	
b. Ground Water	
c. Minerals and building materials	
d. Hazards of Mining	
e. Energy - fossil fuel	
f. Energy - nuclear, hydro, solar, geothermal	
g. Soil and Agriculture	
IV. Climate change	7
a. Climate feedbacks	
b. Paleo-climate	
c. Global warming	
d. Sea-level rise	
e. Ocean acidification	
f. Carbon dioxide and climate	
g. The anthropocene	
h. Mass extinctions of the past and the present	

Note that lecture content is subject to change without warning.

## Laboratory schedule

Aug. 26-30	No lab
Sept. 2-6	Reading maps
Sept. 9-13	Minerals
Sept. 16-20	Plate tectonics
Sept. 23-27	Earthquakes
Sept. 23-Oct. 4	Volcanos
Oct. 7-11	Rivers and floods
Oct. 14-18	No lab (fall recess Th/Fr)
Oct. 21-25	Groundwater
Oct. 28-Nov. 1	Water pollution
Nov. 4-8	Geological time
Nov. 11-15	Climate proxies
Nov. 18-22	Global change and mass extinction
Nov. 25-29	No lab (Thanksgiving week)
Dec. 2-6	Natural History Museum

Classes end on December 6, 2019.

Lab Handouts will be given out each week.  
Students must read the material before the lab.  
Each lab will start with a quiz.

You may switch lab schedule if you find a fellow student that wants to switch with you. This is the only way to switch lab. Inform your TA of the switch. We will accommodate your time constraints as much as possible.

## Textbook

Brian J. Skinner and Barbara W. Murck, The Blue Planet, An introduction to Earth System Science, Wiley ed.

## Recommended reading

Robert M. Hazen, The Story of Earth, Penguin Books

Yuval Noah Harari, Sapiens, A Brief History of Humankind

Elizabeth Kolbert, The Sixth Extinction: An Unnatural History

## Statement on Academic Conduct and Support Systems

### Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, “Behavior Violating University Standards” [policy.usc.edu/scampus-part-b](http://policy.usc.edu/scampus-part-b). Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

### Support Systems:

*Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call*

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. [engemannshc.usc.edu/counseling](http://engemannshc.usc.edu/counseling)

*National Suicide Prevention Lifeline – 1 (800) 273-8255*

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. [www.suicidepreventionlifeline.org](http://www.suicidepreventionlifeline.org)

*Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call*

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. [engemannshc.usc.edu/rsvp](http://engemannshc.usc.edu/rsvp)

*Sexual Assault Resource Center*

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: [sarc.usc.edu](http://sarc.usc.edu)

*Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086*

Works with faculty, staff, visitors, applicants, and students around issues of protected class. [equity.usc.edu](http://equity.usc.edu)

*Bias Assessment Response and Support*

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. [studentaffairs.usc.edu/bias-assessment-response-support](http://studentaffairs.usc.edu/bias-assessment-response-support)

*The Office of Disability Services and Programs*

Provides certification for students with disabilities and helps arrange relevant accommodations. [dsp.usc.edu](http://dsp.usc.edu)

*Student Support and Advocacy – (213) 821-4710*

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. [studentaffairs.usc.edu/ssa](http://studentaffairs.usc.edu/ssa)

*Diversity at USC*

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. [diversity.usc.edu](http://diversity.usc.edu)

*USC Emergency Information*

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. [emergency.usc.edu](http://emergency.usc.edu)

*USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.*

Provides overall safety to USC community. [dps.usc.edu](http://dps.usc.edu)